DESIGN, CONSTRUCTION AND MAINTENANCE OF CITY STREETS

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I should like to say now before starting my talk that we, in the Engineering Division of the City of Louisville, are having the same difficulty as Mr. Bray in obtaining sufficient personnel due to the constitutional limitation of $5,000 salary.

I am truly sincere when I say that I appreciate the privilege and honor of being one of your speakers at this first Kentucky Highway Conference in these recent years.

Nevertheless, I am compelled to admit that I have been constantly wondering what persuaded me to take on this assignment. For as David Lee would say it—"I am not a good public speaker; I either mumble or yell; I can't remember funny stories and I couldn't tell them if I did." I don't know anything you don't know about the subject on which I am to speak. Under such circumstances anything I have to say will neither be inspirational, entertaining, nor informative; and I have been informed by competent authority that those are the only three excuses for any type of speech. However, I have been in public works engineering for the greater part of my adult life.

Please pardon these personal references—but, after graduation here at the University and nearly thirteen years with the Kentucky Department of Highways and seven years with a contractor, I was not in the least hesitant or reluctant in accepting the office of City Engineer of Louisville—a City of about 400,000 population with nearly 1,100 miles of streets and alleys. The previous experience in highway design, construction and maintenance would, in my opinion, fit me perfectly for street and alley design, construction and maintenance. My-oh-My—was not this "big boy mowed down" when he discovered that streets and alleys were in an entirely different category from highways. True, the fundamental mathematics and science were applicable; but many outside factors from true science to a great extent control street design and maintenance.

I found, to my surprise, that there were no available text books or handbooks exclusively on streets. Oh yes, there were chapters on street design in some books on highway engineering. I have been happily informed and I am happy to tell you that the Public Roads Administration will soon issue a handbook on "Street Design." You read a lot on super and super-duper highways and on traffic congestion and arterial streets and so on and how they should be designed and constructed. The design and construction of that type of street or expressway is rapidly becoming well-established.

But, they are not the main "problem child" of the City Engineer. For instance in the City of Louisville such streets would comprise less than 10% of the total mileage of streets and alleys. What about the other streets that all of us City Engineers are charged with? To disillusion or, may I say to enlighten those who in the past have always looked upon municipal streets and alley engineering as only a small sub-division of highway engineering, I have chosen to speak on that vast and all-inclusive subject "Street Design Construction and Maintenance," any phase of which could easily take the twenty minutes to which this talk will be confined. We can only introduce the field today and it is my sincere hope that more detailed subjects and possibly, a municipal engineers section of this conference will be on the program in the years to come.

Streets form the major framework of a city and their system is probably its most important single element. It is the most permanent element in the community. The street system determines the traffic habits of the people,—the ease, the convenience and safety of traffic. The street system establishes the sizes of blocks—and, believe me, to a great extent, the health, safety and morals of a community. The street rights-of-way form channels for light and air to the property on either side and provides space for overhead and underground utilities.

The recent movement toward urban expressways has revealed to the engineer how important to a community is its street pattern. The people do not want the street pattern to which they are adjusted, in the least disturbed. Therefore, the location of streets or in other words, the City Planning, is an important and often in smaller cities a neglected phase of muni-

cipal engineering. Once a street has been dedicated and opened, utilities installed, and abutting properties improved with buildings, the relocating, closing or widening of that street involves the greatest and often insurmountable, difficulties and expense. The location of streets merits our most painstaking consideration.

The City Engineer, in designing his streets, must first determine the classification of that street. In other words, is it (1) a Major Thoroughfare or arterial street or is it (2) a Principal Street or (3) a Secondary Street? Defining these three classes in my own terminology—a Major Thoroughfare is similar to Broadway in Louisville or Main Street in Lexington and should have a minimum of four moving lanes, more often six. Assuming a moving lane as ten feet wide and a parking lane as eight feet; a street with four moving lanes and no parking would be 40 feet wide; add to that two parking lanes and we have a minimum pavement width of 56 feet for a Major Thoroughfare.

I pause here to say that in many instances arterial streets are continuations of the highways entering the City and we City Engineers insist that highways do not stop at the City Limits but continue through the town. We feel, therefore, that these streets are the responsibility of the Department of Highways.

We know that on some few high-speed streets or expressways, eleven foot, and possibly twelve foot, moving lanes should be recommended; but in my opinion, the economic justification of a width of over ten feet per driving lane on a City street is an "exception rather than the rule."

Both the Principal Street and the Secondary Street—my terminology again—are feeders for the Major Thoroughfare or Arterial Street. The Principal Streets provide for the main streams of local traffic around a neighborhood and, in effect, should define the boundaries of a neighborhood. In line with modern accepted practice, we, in Louisville, are attempting not to pass Principal Streets through our existing neighborhoods. The Planning and Zoning Commission are also "neighborhood-minded" and recent subdivisions provide the additional rights-of-way and provisions for the "Principal Streets." Unfortunately, most existing cities have to be content with super-imposing a semi-neighborhood plan on an uncoordinated system of "already" subdivided areas with their fixed street layouts and

rights-of-way often inadequate. In Louisville, we design our Principal Streets with a pavement width, curb to curb of 36 feet to provide for two moving lanes and two parking lanes.

The secondary streets provide access from the neighborhood to the peripheral principal streets and are mainly for the purpose of serving the buildings that abut upon their frontages and should be so designed as to discourage their use by traffic that does not originate or have its destination within that respective neighborhood. In Louisville our Secondary Streets have a pavement width of 26 feet to provide one moving lane and two parking lanes. Passing of traffic in opposite directions must be at points where cars are not parked. Believe it or not, we have had no serious public reaction to this plan. Please note that we are not now using the "old popular thirty and forty foot widths."

We have discussed so far only Main Thoroughfares and Residential Streets which will comprise most of the street system. But cities have another classification of streets which I choose to call "Heavy Duty Streets." They would be located in large manufacturing districts or near freight terminal and warehouse areas. These streets will carry frequent heavy, but slow loads. In such areas it is often advisable also to widen the lanes, more especially the parking lanes.

So you see—in a well planned street system each street is designed for its indicated function and its traffic impact. Call it "functional street design" or what you like—but first, determine the use or function of a street and then proceed to rationally design that street. It is as absurd to design a street system with all streets the same width, thickness, grade and so on, as it is to design a water distribution or drainage system with all its pipes the same size.

On a highway little consideration need be given to access from adjacent property inasmuch as such points are spaced some distance apart and also the buildings to be served usually set far back from the road. On the contrary, in the City these access points are close together, often as little as 30 feet apart. The house may be as near as twenty-five feet to the right-of-way line. This often limits our grade—for the reason that principal and secondary streets must serve abutting property else they

defeat their primary purpose. With further contrast between the establishing of a grade on a highway and a grade on a street, I found that on a highway we were concerned primarily, insofar as drainage was involved, with removing the water from the roadway and discharging it on to adjacent property, at the low points. On City streets we are concerned first with draining the water from the abutting property to the street and must "lay the grade" that the top of the curb is below the property line. After which the next consideration is the sloping of the street to the catch-basins. The minimum grade on a street with curbs should be 0.4 percent, preferably 0.5 percent. Now please don't forget the poor pedestrian who in most street designs is the "forgotten man." Water must be intercepted before reaching the intersection or cross-walk area so that pedestrians will not have to wade through "rivers of water" or have it splashed all over them. So much for grades and drainage.

Traffic on a highway is fast with little impact from quick stopping and starting. Municipal traffic is much slower with great impact stresses to be designed against especially at major intersections.

The wheel loads to be expected on each type of street is always a point of discussion among "municipal engineers." We all know that the former extreme wheel load is rapidly disappearing, and, I am happy to say, not particularly because of the failure of pavements but more especially for the reason that the truck designer found that his truck had greater operating efficiency with multiple wheel assemblies with somewhat lighter unit wheel loads.

Generally accepted practice for wheel loads is as follows:

Main Thoroughfares—9,000 pounds per wheel

Principal Streets—7,500 pounds per wheel

Secondary Streets—6,500 pounds per wheel

On heavy streets a wheel load of 11,000 pounds may be indicated. This does not mean that a load exceeding these will not be carried by such streets but it does mean that such heavier loads will be infrequent and not the usual expected load.

So much for street design—we shall now touch briefly on the main differences between street and highway construction and

maintenance. Please remember that this is not an all-inclusive technical paper but only an introduction to this vast subject and detailed discussions should be included in future conferences.

Public Works touch the people more intimately than any other municipal function and the construction and maintenance of streets are probably the most common public works of the City. The people generally are not interested in the design of a street until the construction starts. After then each and every citizen becomes a critic of your work. The construction and maintenance must be done speedily and efficiently. An ordinary delay which would hardly be noticed in highway work may become a major problem in street construction and maintenance and possibly reach the newspaper or even the "Mayor's Beef Session."

The design of City Streets greatly differs from highway design; but, in general, the methods and materials of highway and street construction and maintenance are essentially the same.

Now don't forget—Louisville has about 400,000 population —nearly one-sixth the population of Kentucky—in its 40 square miles. Louisville has a density of over nine thousand two hundred people a square mile and the remainder of Kentucky including Lexington, Covington and all the other cities has a density of only 62 people a square mile—nine thousand two hundred compared to only 62 or 150 people on the same area on which the rest of the state has an average of only one person.

Let me divert here to say that it is often unjustly said that Louisville does not consider itself a part of Kentucky. Of course, this is not true. We depend on Kentucky—we must have you. Our only concern is that the rest of Kentucky will be sure to consider Louisville a part of Kentucky.

So you see the impact of public opinion and reaction is much more severe in regard to your street construction and maintenance than on highways. Therefore, the methods must be speedy and efficient. A hole in a street left unrepaired has brought numerous telephone calls, letters to the Mayor, Lemme-Do-It and so on.

We are continually dealing with the Utility Companies— Water, Gas and Sewer Pipes, Power, Telegraph and Telephone

Cables, all underground—each making cuts through pavements which must be repaired and maintained.

Our street problems are many, varied and manifold; but I am happy to say—can be and are solved. They are all challenging and interesting.

Today, we have talked only in generalities and have dealt little with specific problems. We have hardly scratched the surface. You will find that the City Engineers of Kentucky are most co-operative and readily exchange ideas and experience with each other and I feel sure that further detailed discussions of our mutual problems in future conferences here would be highly beneficial and render a positive service to us all.

Before I close I want to say: If there are any questions, I shall be glad to attempt to answer them and also to say—I am genuinely thankful to you for this pleasure.